The American Biology Teacher

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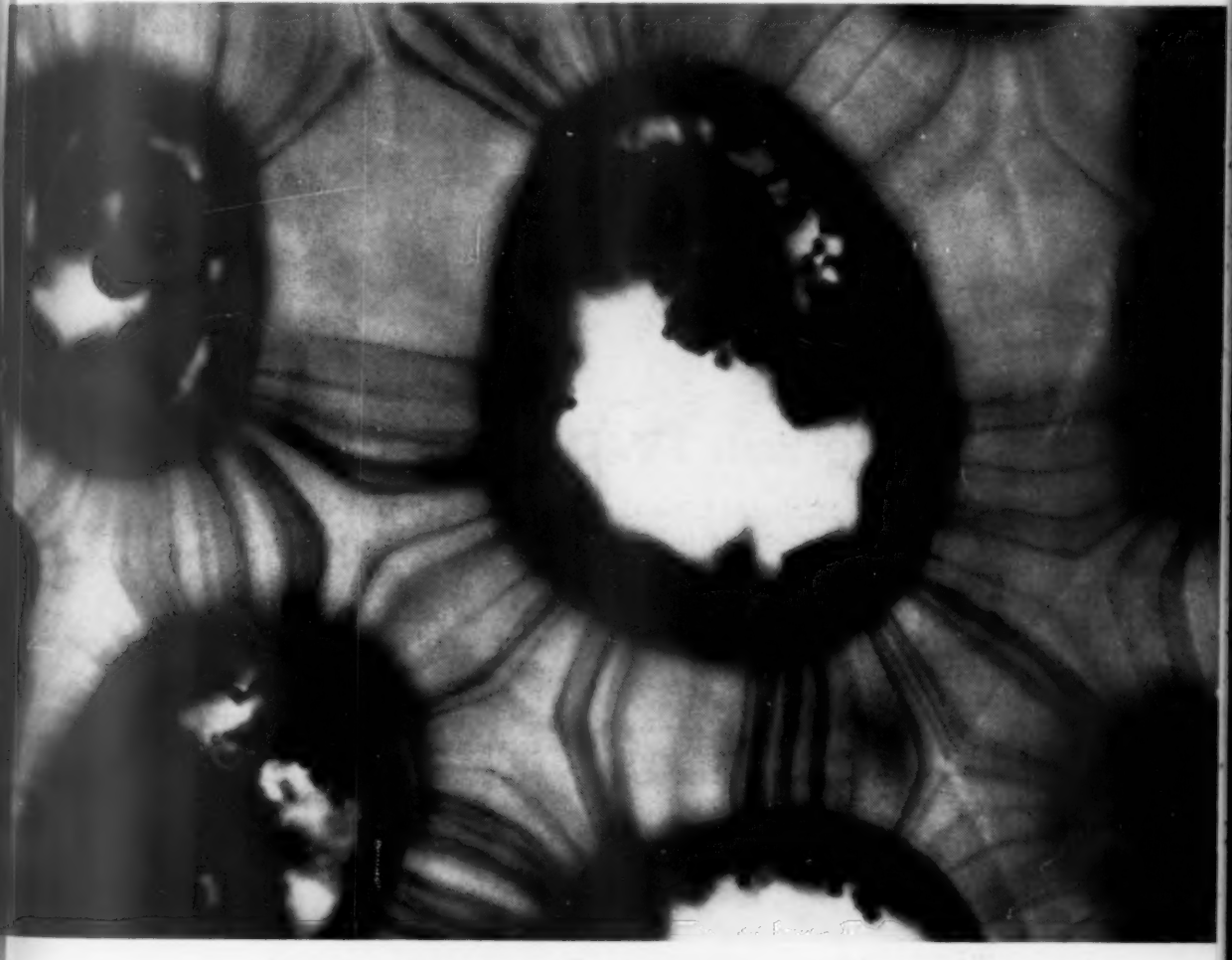
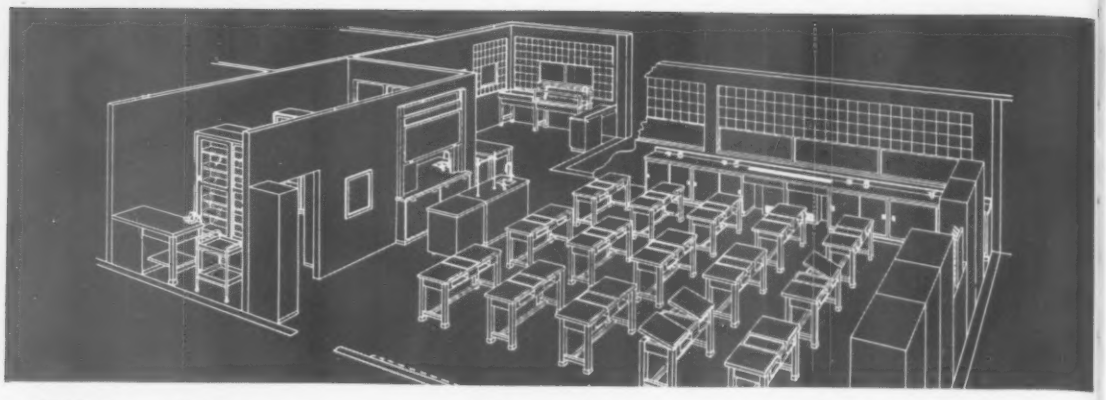


Summer Institute Directory

High School Biology Exchange

Paper Chromatography



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Cover Photograph

Plasmodesmata, fine threads of protoplasm, are shown extending through the thick cell walls of persimmon endosperm. Photomicrograph by Dr. H. L. Dean, Professor of Botany, The State University of Iowa.

THE AMERICAN BIOLOGY TEACHER

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Biology Laboratory Assists from the Hospital Laboratory*

J. L. ARBOGAST

Director of Clinical Laboratories, Indiana University School of Medicine, Indianapolis, Indiana

The subject of biology includes so much that it is not surprising to find much variation in our high school courses. Further, the inclinations and interests of the teacher controls to a considerable extent, the developing interests of the students. In like manner, my remarks undoubtedly reflect the influence of my experience in medicine as it affects my ideas about biology. Since that is true, and medicine presents many opportunities, examples and projects, perhaps my remarks will include one or two motivating ideas for each of you. I shall review a number of the topics included in high school biology, with examples of their application in medicine and suggestions as to their use as motivation for high school students.

The various morphological phases of biology offer many opportunities for projects, although, they will seldom be selected by students without guidance or encouragement. A visit to a hospital surgical pathology tissue preparation room will interest them primarily in specimens and secondarily in the various technical phases of fixing, blocking, cutting and staining tissue for examination. A subsequent interest in histology or even pathological histology may develop. On the other hand, they may become interested in the subject of Papanicalaou smears. Papanicalaou is a New York anatomist who found that simply smearing body secretions on a glass slide quickly followed by immersion in an alcohol-ether mixture would cause sufficient cells to adhere to permit diagnosis. The most commonly used medical application now is in the examination of vaginal smears for cancer. Material from any high school dissection, be it frog, earthworm or anything of the sort, may be easily smeared on slides which are dipped into an alcohol-ether fixative immediately, and work carried on from there at leisure. It becomes possible for students to carry on investigation with practically no apparatus and very small supplies of staining dyes and material. Unfortunately, the difficulties in diagnostic cytology are such that they may become easily discouraged from that point on. However, there are many other side avenues open which are perhaps easier and can be utilized. One of the most common is the collection of blood smears; smears from various animals such as frog, guinea pig, bird, other pets and man. Various opportunities in white and red cell study should prove fascinating. Again the equipment is quite nominal and consists largely of a few stains. Perhaps these examples serve to illustrate pure morphology.

The less explored side of physiology in biology offers just as many good examples, and, perhaps, combination examples that will stimulate greatly. As one example, one may study morphology as well as genetics when you make a classification of finger prints. I once had to delve into this subject merely to find out how to take good finger prints. I realize that with the tendency toward collection, it would be easy to interest certain pupils in certain phases of finger print classification, collect prints of their classmates in school, and form their own rogue's gallery. In a similar way, the equipment for blood grouping is quite simple and easy to use. It would be possible for a student to group the blood of all his classmates and perhaps in that manner stimulate an interest in genetics. Girls are particularly interested in the subject of the Rh factor. It is possible to work out Rh factors without too much trouble. Students many times need to be led into simple types of activity rather than undertaking the investigation of cancer with the idea that they can find a cure.

Along the line of comparative anatomy there are a great many opportunities offered. All of you use dissection in your laboratory periods. It does not make a great deal of difference what animal you use. Might I suggest that tests for pregnancy offer a motiva-

*Taken from a speech presented before the Biology Section of the Indiana State Teachers' Association.

tion. I do not know why it is, but in our clinical laboratory women will pay for a very early diagnosis of pregnancy much more readily than pay for tests to determine whether or not they have cancer or diabetes. Perhaps it may be ascribed to anxiety or curiosity, but certainly curiosity is a sufficient reason for your students. The whole principle of pregnancy tests, as we use them, depends on the fact the pituitary and/or chorionic hormone stimulates the mechanism in animals which do not go through a periodic estrus and which therefore are used in a number of laboratories. The reaction is read either by the cornification of vaginal epithelium or by the appearance of ruptured follicles in the ovaries. The rat or the much easier to use and more accessible animal, the rabbit, is commonly used. It is only necessary to inject about 10 cc. of urine, preferably on two successive days, and then on the following day sacrifice the animal and note the ruptured follicles of the ovaries. Recently lower animals have been used. One of the easiest is the male frog or toad. If one injects urine or urine concentrate into the dorsal lymph sac of the male frog, it responds by putting out sperm which are easily recognized in a urine specimen. Urine will be produced by stroking the ventral surface of the frog. The need to inject into the dorsal lymph sac makes anatomical study necessary. Incidentally, we use frogs but once and give them away locally. Perhaps your local hospital will serve as a free source of animals for you.

I recall that during my high school experience, I was more interested in the physics, the chemistry, and the instrumentation rather than the fundamental physiology of biology. There are an unusual number of opportunities for the modern high school individual who is interested in some knowledge of instrumentation and electronics. For example, I have technologists who can do an excellent prothrombin determination but who are at a loss when a fuse blows, or when the relay contacts chatter, or when there is a short or open circuit. Most of our technologists arrive at actual performance stages without an adequate training in the use of the ordinary analytical balance. Even more so is this true for visual or photoelectric colorimeters. It is amazing what your students can do at improvising adequate equipment and teaching themselves this type of thing. For example, one can take two graduated tubes and, by dilution in one tube or the other, can work out a ratio comparison of the strength of colors and thus improvise a satisfactory substitute for a visual colorimeter. It is perfectly possible to do blood sugar tests or urine sugar tests with two such graduated tubes and come out within the inherent error of the method itself. I have had one boy, a technologist, who built up his own photoelectric colorimeter using a barrier layer light sensitive cell and electrical components picked up from army surplus. It worked out to be quite a satisfactory instrument. The modern techniques of electrophoresis are similar illustrations. Each man has developed his own, and though there are various outfits now placed on the market for sale, there is a marked divergence among them. One can make a very satisfactory instrument from pieces of plexiglass and cement.

Isotopes now are readily available. Our youngsters are advanced enough in electronics to figure out instruments for detection of radioactive materials in the amounts we now employ. This might be a relatively unusual type of activity, but I am sure it would be very attractive to the radio "hams" and individuals with a sufficient knowledge of electronics to put together the instruments. The physics department particularly would be involved in this sort of thing as an inter-departmental venture.

In modern days the development of antibiotics has afforded another motivation for the study of bacteriology and mycology. In former days, it was not safe to have medical students play with strains of staphylococci which might be dangerous. I recall many a distorted leg carbuncle and recall even death from staphylococcic infection. We have practically closed that section of our children's hospital formerly used for bone infections and converted it to other uses because of the advent of penicillin and other antibiotics which minimize present day danger from staphylococci. Penicillin itself is the result of an adventure among the molds. Who would have thought mold investigation promising? Research today still goes on to find better and other antibiotics. I would like to point out that our adaptive bacteria can acclimate and tolerate doses of one or more antibiotics and so the search must constantly go on for new

and different ones. This perhaps is one of the areas where the possibilities have not been exhausted. Your youngsters can secure soil samples and tap other sources for experimentation.

The disc assay method is quite easy and inexpensive, and with paper discs, students can test effects on certain organisms or, by reversing the procedure, can test cultures of organisms. They can test the molds they collect.

Botany as a branch of biology did not interest me as did the animal side, but there are numerous examples of how botany can be motivated. Most of you are aware of the fact that the digitalis leaf is the principal drug in use today in the control of certain heart diseases. I will admit the chemists have taken digitalis and have produced concentrates and perhaps better specific compounds, but as late as a year or so ago, the Rauwolfia compounds were developed to control high blood pressure, a problem that has always been with us. Presently, many derivatives of snake root are being developed as tranquilizing drugs. I have recently learned of the use of alfalfa hay infusion for rheumatism. I have no idea whether this empirical remedy is of value or not, but certainly an investigation during the next few years will prove its worth.

I think it is well for high school students to realize that subjective as well as objective factors enter into every investigation they undertake. For example, one may have a colony of tropical fish to study their metabolism and adaption and reproduction. I heard of a sadistic yet humorous project the other day being carried out by an older dentist. He was deliberately feeding tropical fish maximum amounts of various male sex hormones, and while a number of his fish died, he developed amazing differences and perhaps will produce a mutant which he can fix and reproduce. Others have fed antibiotics. Aureomycin, for example, contains a growth factor.

The use of egg embryos for culture is one which might appeal to some individuals. We have not had very many who seemed interested in parasitic diseases, but those that become really interested delve into the subject deeply and become addicts to the specialty. I recall one youngster, the son of a doctor, who had had experience in attending postmortems and who aided me on a few occasions. I think the high spot of his autopsy experience was the fact that from one individual, he collected the adult parasitic worms we identified within the intestine of the individual. He was quite happy that he could count 395 ascari and carefully cleaned and pickled the whole group in alcohol. I have no idea what has been the subsequent fate of his collection of worms.

As for immunology, it is perhaps one of the more difficult concepts, yet here again there are very simple examples which will serve you well. The use of blood specimens obtained by sticking the finger serve for differentiation into the blood groups and the various blood factors. The literature coming with the serum gives sufficient information and cites adequate references. In addition, these serums are inexpensive. They are available from state civil defense blood bank headquarters for training purposes. The use of the intra-dermal tests employed by the school physician may fascinate some. Certainly the tuberculin tests or brucella tests which they have an opportunity to see, and perhaps utilize, may be developed into a worth-while project. We now have the so called patch tests; i.e., material which avoids any type of injection so that we remove that element of danger.

One of the most important results of such projects is the awareness of exactitudes of techniques and the fact that there is a certain limit to the accuracy which is dependent upon scrupulous observance of detail. Immature students will have difficulty in forming conclusions, but certainly any conclusion is dependent upon accuracy which in turn is dependent upon the use of controls. Any simple project then affords you the opportunity of teaching them true research methods. It involves planning of the project, investigative reading about it, development of controls, and finally drawing conclusions. Even if the whole thing is a total loss from the standpoint of productivity, it certainly is not all loss when it is realized that the individual has an idea of research. It is such basic understanding and interest and training which develops into productive research.

I have referred in a number of instances to the fact that a trip to your local hospital and its laboratory would be extremely worth while. The need for laboratory technologists is one that greatly exceeds the demand. The

current minimum educational requirement is two years of college, but, the majority now have three years of college which with the one year of hospital experience makes a degree program almost standard. Because there are approximately ten openings for every technologist capable of filling them, technologists themselves are engaging in an expanded recruitment program among high schools. Therefore, during the next few years your own school will undoubtedly be contacted by one or more of these folks. Why not meet them half way and arrange for a tour of the hospital laboratory by your own class. I am sure you as well as your students will find the tour fascinating and productive in the way of a liaison. Some of your students may be interested in medical technology as a career.

The opportunity in technical fields is continually expanding because of the continued tendency to specialization. Workers are needed all along the way from those who can merely carry out routine tasks, the third class thinkers, to those technologists who are able to act independently and carry on their own work. They might be called the second class thinkers. Then there are those who are able to discover for themselves new things: the truly first class thinkers capable of research work. We as teachers are second class thinkers ourselves and expect our pupils to repeat back parrot fashion what we give them —third class thinking. Relatively few of us actually discover and do and produce for ourselves and thus are truly first class thinkers. Yet our ultimate aim is to encourage and develop such capabilities and skills in ourselves and our students. If we can develop first their interest in any way in any type of project, we will turn them into avid readers. Avid readers cannot help but think of variations and possibilities and in turn become real researchers. Of the researchers, there are undoubtedly those who will discover new things and appreciate that what they have discovered is new and has value.

Granted that many may fall along the way, we can still use them in various phases of medicine. There are medical record librarians, there are physical therapists, there are occupational therapists, there are sanitarians, there are nurses, there are medical technologists—all of whom can be recruited from this group which you are presently molding in your courses in biology.

The National High School Biology Exchange Club

GUY T. PINKARD
North Shore High School, Glen Head, Long Island, New York

In the fall of 1954 the Sea Cliff High School Biology Club was formed as a subdivision of The Senior Science Club. The new organization was sponsored by Mr. Guy T. Pinkard, biology teacher at the Sea Cliff High School, New York.

The Biology Club members adopted their own constitution and elected officers. A club emblem was then designed by Miss Dorothy Gerroir, a biology club member. The members voted, as a club project, to exchange flora and fauna with other high schools in the United States. The Chambers County High School in Milltown, Alabama was chosen as the first exchange school. Many interesting mounted specimens were exchanged between the two schools. Four of the members of the Sea Cliff club actually delivered the specimens in person to the Milltown High School during the Easter holidays. Then one of the Milltown students came to Sea Cliff later in the spring of 1955 to complete the exchange.

The school year of 1955-56 introduced the Vashon Island High School in Burton, Washington as the second exchange school with the Sea Cliff High School Biology Club. These two clubs did an excellent job in exchanging specimens between the Pacific Coast and the Atlantic Coast. Vashon Island was chosen by the Sea Cliff club because of an article in *Readers Digest* about Mr. Lane, the biology teacher, and his work. It was during this year that the members of the Sea Cliff Biology Club decided it would be beneficial if Vashon Island and Milltown could get together with an exchange program. This idea was really the conception of the National High School Biology Exchange Club (Bio-Ex). It was decided that if a national club was formed, and each chapter would send one

mounted specimen to all other clubs, then schools throughout the United States would be sharing in exchanging ideas and specimens as well.

The Biology Club members at Sea Cliff then began preparing charters, handbooks, emblems, a gavel, a constitution, and check sheets so that Alpha Chapter could be formed. This took many months of activity and preparation. On March 28, 1956 the Biology Club members and their parents met at a well-prepared banquet. A motion was made by Henry Goldman that the Sea Cliff High School Biology Club be disbanded and Alpha Chapter of the National High School Biology Exchange Club be formed. David York of the Sea Cliff High School thus became the first president of the National High School Bio-Ex Club. The gavel was presented him by Mr. Pinkard, and the first business meeting was in progress. A motion was made and carried that Milltown, Alabama; Vashon Island, Washington; and Uniondale, New York be invited as Beta, Gamma and Delta Chapters. Invitations were sent out, and before the end of the school year in June, 1956, all three schools had accepted. They became the four pioneering clubs in this enterprise. The emblem, charter, constitution, colors (sun yellow, forest green and pure white), flower (yellow Marguerite daisy), and handbook were adopted, and the club was ready to function.

It was decided that only about fifteen schools be invited each year, since a larger accumulation of specimens by each chapter would necessitate a great degree of student activity to complete the necessary exchanges.

When school opened in the fall of 1956, invitations were sent to these schools that they might see the plan which would implement the exchange concept. Before Christmas of that year the Brookline, Massachusetts, High School Biology Club was charted as the Epsilon Chapter. The Sea Cliff High School students were busy planning the first national convention to be held at the Sea Cliff High School June 7, 8, 9, 1957. Before June the following chapters had been chartered.

ZETA: Simpson Memorial High School; Huntington, New York.

ETA: Northside High School; Atlanta, Georgia.

THETA: Wheaton Community High School; Wheaton, Illinois.

IOTA: Hackettstown High School; Hackettstown, New Jersey.

With only nine chapters the club is truly national in scope. Chapters now exist in six states of the union. Invitations are being mailed out to schools with outstanding biology clubs inviting them to become a part of the organization. A school may also become a member of the national club by submitting a letter to the national secretary (Miss Betty Martin, North Shore High School, Glen Head, New York).* She will then mail ballots to all member clubs, and when fifty percent of the chapters vote "Yes," the club is accepted and chartered.

The first national convention was a complete success, and the following slate of officers was elected.

President—Mr. John Cook, IOTA, Hackettstown, New Jersey

Vice President—Miss Jean Ingraham, BETA, Vashon Island High School, Burton, Washington

Secretary—Miss Betty Martin, ALPHA, North Shore High School, Glen Head, New York

Treasurer—Miss Betty Krumrine, ALPHA,

*The Sea Cliff High School was consolidated and is now The North Shore High School, Glen Head, L. I., New York.

North Shore High School, Glen Head, New York

Historian–Miss Clare Koch, ZETA, Simpson Mem. High School, Huntington, New York

National Sponsor–Mr. Lynn G. Robinson, BETA, Vashon Island High School, Burton, Washington

A national board of directors was chosen to make sure that the club was sound and to pass on all monetary and legal matters that might confront the club. They are:

Mr. Richard Siegal–Lawyer–Sea Cliff, New York

Mr. Kenneth Seaman–Science Associates–Doylestown, Pennsylvania

Dr. Elizabeth Simendinger–Head of Science Department, Uniondale High School, Uniondale, New York

The second annual convention is scheduled at the Wheaton, Illinois High School in April, 1958. The organization has set this date as the deadline for a twenty chapter membership.

As has been stated before each club chooses a nickname, and mails a specimen of that nickname to all other clubs. This specimen is to be mounted on a varnished board, classified and explained, well labeled and bearing the name of the chapter and school from which it was sent. In this manner the biology department of each member school is benefited by the club. The nicknames so far are:

ALPHA–Horseshoe (King) Crab
BETA–Madrona
GAMMA–Honey Locust
DELTA–Moon Snail
EPSILON–Lobster
ZETA–Starfish
ETA–Pine Lizzard
THETA–Undecided
IOTA–Trout

With this foundation now in existence it is our belief that as schools throughout the United States learn more about the organization, The National High School Biology Exchange Club (Bio-Ex) will grow to be a large and useful student group dedicated to the improvement of biology classes and the exchanging of ideas and specimens.

Radiation Biology Summer Institutes

Twelve Summer Institutes in radiation biology, for high school science teachers, will be held in 1958. These institutes, sponsored jointly by the United States Atomic Energy Commission and the National Science Foundation will help bring high school science teachers up-to-date in one of the newest and most exciting fields–radiation biology.

The programs will be tailored to have immediate, practical use in the high school, particularly in laboratory activities. It is hoped that science teachers trained in this program will return to their schools more enthusiastic and better equipped to teach. They should be able to encourage more high school students to choose science as a career.

Following is a list of the directors and the location of the Institutes. Information and application blanks can be secured by writing the director. All applications must be filed by February 15, 1958.

Dr. Richard R. Armacost
Department of Biological Sciences
Purdue University
Lafayette, Indiana

Dr. G. B. Castle
Department of Biology
Montana State University
Missoula, Montana

Dr. Raymond L. Libby
Professor of Radiology
University of California
School of Medicine
Los Angeles 24, California

Dr. H. O. Ried, Director
Division of Extension
Summer Session and Community Services
University of New Mexico
Albuquerque, New Mexico

Dr. Bryce C. Brown
Biology Department
Baylor University
Waco, Texas

Dr. Lane A. Compton
Department of Physics
Brigham Young University
Provo, Utah

Dr. William B. Owen
Department of Zoology
University of Wyoming
Laramie, Wyoming

Dr. Howard A. Robinson, Chairman
Physics Department
Adelphi College
Garden City, Long Island
New York

Dr. Arthur K. Solomon
Harvard University Medical School
Boston 15, Massachusetts

Dr. Arthur J. Vorwald
Professor and Chairman
Department of Industrial
Medicine and Hygiene
Wayne State University
Detroit 7, Michigan

Dr. Marie C. Taylor, Director
Howard University Biology Building
Washington 1, D. C.

Dr. Karl Wilbur, Chairman
Department of Zoology
Duke University
Durham, North Carolina

Foundation Announces 108 Summer Institutes For High-School and College Teachers of Science and Mathematics

Approximately 5,000 high school and 250 college teachers of science and mathematics will benefit during the summer of 1958 from teacher-training programs sponsored by the National Science Foundation at 108 summer institutes in 104 educational institutions.

Awards of the grants totaling $5,340,000 for the support of the summer institutes were just announced by Alan T. Waterman, Director of the Foundation. Ninety-nine (99) of the institutes will be open only to high-school teachers of science or mathematics. Four will be open to both high school and college teachers and five to college teachers only. Roughly 5,000 high-school teachers and 250 college teachers will be enabled to participate through stipends and tuition provided by the National Science Foundation. Twelve institutes offering courses in radiation biology for high-school teachers are being jointly sponsored by the Foundation and the Atomic Energy Commission.

"The summer-institutes program of the Foundation is in step with current plans for strengthening the training of scientists in the United States," said Dr. Waterman, in announcing the awards today. "Good science teachers are apt to be the first to stimulate an interest in science among our young people in secondary schools. But if instruction is not stimulating, and contains outdated concepts, it tends to weaken youths' motivations toward science careers. Foundation-supported summer institutes provide opportunities for thousands of hard-pressed high-school science teachers to learn at first hand the rapidly advancing developments in today's science, mathematics, and engineering.

"A total of 108 summer institutes for 1958 will be established in 104 host institutions of higher learning, spread widely across the Nation in nearly every State. Begun experimentally in 1953 with two institutes, the program has been expanded each summer to a point where the Foundation supported 96 institutes last summer. Providing intensive training in science subject matter, these institutes have suggested methods by which colleges and universities may consider similar subject-matter emphasis in their course offerings to prospective teachers of science and mathematics. The program has been given substantial impetus by the Congress which for two successive years has ear-marked $9.5 million of the Foundation's appropriation to assure supplementary training for secondary-school science teachers."

The Foundation grants to each summer institute will cover costs of tuition and other fees for a specified number of teachers—from 20 to 100, the average size to be approximately 50. Most institutes will pay stipends directly to participating teachers at a maximum rate of $75 per week. Additional allowances for dependents up to a maximum of four and for travel are provided.

For High-School Teachers Only, except as follows:
***For College Teachers Only**
****For High-School and College Teachers**

Host Institution	Director	Teaching Fields of Participants for Whom Institute Is Designed						
		Biology	Chemistry	Earth Science	General Science	Mathematics	Physics	Radiation Biology
ALABAMA								
Alabama College	Paul C. Bailey, Biology Department	X	X		X		X	
Alabama, University of	Charles K. Arey, College of Education	X	X	X	X	X	X	
Tuskegee Institute	W. Edward Belton, Chemistry Department		X					
ALASKA								
Alaska, University of	Alfred M. Bork, Physics Department	X	X			X	X	
ARIZONA								
Arizona, University of	Millard G. Seeley, Chemistry Department				X	X		
ARKANSAS								
Arkansas, University of	Lowell F. Bailey, Botany and Bacter. Dept.	X	X		X	X	X	
CALIFORNIA								
California, University of (Berkeley)	Robert A. Rice, University Extension	X	X	X	X		X	
California, University of, Medical Center (Los Angeles)	Raymond L. Libby, Radiology Department	X	X		X		X	X
**Claremont College	Willis E. Pequegnat, Zoology Department	X			X			
San Jose State College	Wilbur Sprain, Natural Science Department				X			
Southern California, University of	Charles S. Copeland, Chemistry Dept.		X				X	
COLORADO								
Colorado College	Lewis N. Pino, Cutler Hall	X	X		X	X	X	
Denver, University of	Byron E. Cohn, Physics Department		X				X	
CONNECTICUT								
Connecticut, University of	David J. Blick, Physics Department						X	
Wesleyan University	Vincent W. Cochrane, Biology Department	X	X	X	X	X	X	
DELAWARE								
Delaware, University of	Cecil C. Lynch, Chemistry Department	X	X		X	X	X	
DISTRICT OF COLUMBIA								
American University	Leo Schubert, Chemistry Department		X				X	
Howard University	Marie C. Taylor, Botany Department							X
FLORIDA								
Florida State University	J. Paul Reynolds, Col. of Arts and Sciences	X	X		X	X	X	
GEORGIA								
Atlanta University	K. A. Huggins, Chemistry Department	X	X			X		
Georgia, University of	T. H. Whitehead, Chemistry Department	X	X		X	X	X	
HAWAII								
Hawaii, University of	John J. Naughton, Chemistry Department	X	X		X	X	X	
IDAHO								
Idaho, University of	W. H. Cone, Physical Science Department	X	X			X	X	
ILLINOIS								
Chicago, University of	Alfred L. Putnam, Eckhart Hall 411					X		
*Illinois, University of	D. M. Henderson, Geology Department			X				
Illinois Wesleyan University	Wayne W. Wantland, Science Division	X	X			X	X	

Host Institution	Director	Teaching Fields of Participants for Whom Institute Is Designed						
		Biology	Chemistry	Earth Science	General Science	Mathematics	Physics	Radiation Biology
INDIANA								
Indiana University	Shelby D. Gerking, Zoology Department	X						
Notre Dame, University of	Arnold E. Ross, Mathematics Department					X		
Purdue University	R. R. Armacost, Biology Science Dept.	X						X
IOWA								
Drake University	R. R. Haun, Physical Science Department	X	X		X		X	
Iowa State College of A and M Arts	J. A. Greenlee, Science Division	X	X		X	X	X	
Iowa State Teachers College	Dorothy C. Matala, Biology Department				X			
KANSAS								
Kansas State Teachers College	Otto M. Smith, Chemistry Department	X	X	X	X		X	
**Kansas, University of	G. Baley Price, Mathematics Department					X		
KENTUCKY								
Murray State College	Alfred M. Wolfson, Biological Sciences Dept.	X	X	X	X		X	
LOUISIANA								
Dillard University	Edward E. Riley, Jr., National Science Div.	X	X					
Louisiana State University	H. B. Williams, Chemistry Department	X	X			X	X	
MAINE								
Bowdoin College	Noel C. Little, Physics Department						X	
Colby College	Evans B. Reid, Chemistry Department	X	X			X	X	
MARYLAND								
Maryland, University of	Joshua R. C. Brown, Zoology Department	X	X		X		X	
Morgan State College	Thomas P. Fraser, Science Education Dept.	X	X	X	X	X	X	
MASSACHUSETTS								
**Harvard University	A. K. Solomon, Harvard Medical School							X
Tufts University	M. Kent Wilson, Chemistry Department		X			X	X	
*Williams College	Samuel A. Matthews, Biology Department	X						
Worcester Polytechnic Institute	Richard F. Morton, Physics Department						X	
MICHIGAN								
*Michigan State University of A and M Arts	F. B. Dutton, Science and Mathematics Teaching Center		X			X	X	
Northern Michigan College	Holmes Boynton, Mathematics Dept.	X	X		X	X	X	
Wayne State University	Arthur J. Vorwald, College of Medicine							X
Western Michigan University	Charles H. Butler, Mathematics Dept.					X		
MINNESOTA								
Carleton College	Kenneth O. May, Math. and Astron. Dept.					X		
Minnesota, University of (Duluth)	W. R. McEwen, Science and Math. Div.	X	X		X	X	X	
Minnesota, University of (Minneapolis)	J. W. Buchta, Physics Department						X	
Minnesota, University of (Minneapolis)	William H. Marshall, Zoology Department	X						
MISSISSIPPI								
Mississippi, University of	George Vaughan, Chemistry Department	X	X		X	X	X	
MISSOURI								
Missouri School of Mines and Metallurgy	Harold Q. Fuller, Physics Department		X		X	X	X	
St. Louis University	Theo. A. Ashford, Chemistry Department		X					
MONTANA								
**Montana State College	L. O. Binder, Jr., Chemistry Department		X					
Montana State University	G. B. Castle, Biology Department	X						X

Host Institution	Director	Teaching Fields of Participants for Whom Institute Is Designed						
		Biology	Chemistry	Earth Science	General Science	Mathematics	Physics	Radiation Biology
NEBRASKA								
Nebraska, University of	Walter E. Militzer, College of Arts and Sciences	X	X			X	X	
NEW HAMPSHIRE								
New Hampshire, University of	Harold A. Iddles, Chemistry Department		X				X	
NEW JERSEY								
Rutgers University	Emory P. Starke, Mathematics Department					X		
NEW MEXICO								
New Mexico, Highlands University	Lora Mangum Shields, Biology Dept.	X	X					
New Mexico, University of	Harold O. Ried, Director of the Summer Session							X
NEW YORK								
Adelphi College	Howard A. Robinson, Physics Dept.		X					X
Buffalo, University of	Harriet F. Montague, Mathematics Dept.					X		
Cornell University	Richard B. Fischer, Rural Education Dept.			X				
Rensselaer Polytechnic Institute	Edwin Brown Allen, Mathematics Dept.				X			
Union College	George Reed, Chemistry Dept.	X	X			X	X	
NORTH CAROLINA								
Duke University	Henry S. Roberts, Jr., Zoology Dept.							X
Duke University	W. M. Nielsen, Physics Department	X	X			X	X	
North Carolina, Coll. at Durham	William H. Robinson, Physics Department	X	X			X		
North Carolina, University of	Victor A. Greulach, Botany Department	X	X	X	X	X	X	
NORTH DAKOTA								
North Dakota, University of	J. Donald Henderson, Physics Department		X		X	X	X	
OHIO								
Antioch College	James F. Corwin, Chemistry Department				X			
Case Institute of Technology	R. G. Weast, Chemistry Department		X					
Oberlin College	Wade Ellis, Mathematics Department					X		
Ohio University	L. P. Eblin, Chemistry Department		X			X	X	
Ohio Wesleyan University	Howard N. Maxwell, Physics Department		X		X		X	
OKLAHOMA								
Oklahoma, University of	Horace H. Bliss, 61 Faculty Exchange				X			
OREGON								
*Oregon State College	Henry P. Hansen, Graduate School	X						
*Oregon, University of	Robert W. Morris, Biology Department	X						
Reed College	Kenneth E. Davis, Physics Department						X	
PENNSYLVANIA								
Allegheny College	Robert E. Bugbee, Biology Department	X	X	X	X	X	X	
Bucknell University	Lester Kieft, Chemistry Department	X	X		X	X	X	
Lafayette College	Fred V. Roeder, Education Department		X				X	
Pennsylvania State University	William H. Powers, Arts and Science Extension	X	X	X	X		X	
PUERTO RICO								
Puerto Rico, University of	F. Bueso, College of Natural Sciences				X	X		
RHODE ISLAND								
Brown University	Elmer R. Smith, Teacher Training				X	X		
SOUTH CAROLINA								
Converse College	H. E. Shiver, Chemistry Department	X	X				X	

Host Institution	Director	Teaching Fields of Participants for Whom Institute Is Designed						
		Biology	Chemistry	Earth Science	General Science	Mathematics	Physics	Radiation Biology
SOUTH DAKOTA								
State University of South Dakota	Charles R. Estee, Box 57, University Exchange	X	X		X	X	X	
TENNESSEE								
Oak Ridge Institute of Nuclear Studies	Ralph T. Overman, Special Training Div.		X				X	
Oak Ridge Institute of Nuclear Studies	Ralph T. Overman, Special Training Div.						X	
Tennessee Polytechnic Institute	G. B. Pennebaker, School of Arts and Sciences	X	X		X	X	X	
TEXAS								
Baylor University	Bryce C. Brown, Biology Department	X	X		X	X	X	X
Howard Payne College	Richard A. Eads, Science Division				X	X		
Southern Methodist University	Joe P. Harris, Jr., Biology Department	X	X		X	X	X	
Stephen F. Austin State College	H. E. Abbott, Chemistry Department	X	X		X	X	X	
UTAH								
Brigham Young University	Lane A. Compton, Physics Department							X
VERMONT								
Vermont, University of	N. James Schoonmaker, Math. Dept.					X		
VIRGINIA								
Virginia Polytechnic Institute	Thomas M. Hahn, Jr., Physics Department	X	X	X	X		X	
Virginia State College	Richard H. Dunn, Graduate Studies and Research				X			
WASHINGTON								
State College of Washington	Alfred B. Butler, Physics Department	X	X	X	X	X	X	
WEST VIRGINIA								
West Virginia, University	J. K. Stewart, Mathematics Department		X			X	X	
WISCONSIN								
Marquette University	Rezneat M. Darnell, Biology Department	X						
Ripon College	Robert S. Wilson, Physics Department				X	X	X	
Wisconsin, University of	H. Van Engen, Mathematics Department					X		
WYOMING								
Wyoming, University of	William B. Owen, Zoology Department	X						X
Wyoming, University of	W. Norman Smith, Mathematics Dept.					X		

Potent new drugs that lower blood pressure have been synthesized from the welding-torch gas acetylene. In tests on dogs, these new drugs were found to be longer lasting in their effect on blood pressure, as well as more potent, than similar compounds such as hexamethonium bromide which are now in use. In addition, they were taken into the system from the digestive tract with greater ease. Many drugs with new and important properties have been made from acetylene. The female sex hormone, estrone, could be given only by injection until it was combined with acetylene to make an effective oral medicine. Non-barbiturate and non-habit-forming sedatives are now made from acetylene.

The School Service Division, National Geographic Society, Washington 6, D. C., is again offering their subscription service for "The Geographic School Bulletins." The first issue of the bulletins was published October 7th and there will be approximately a weekly edition during the school year. The domestic subscription rate is $1.25 for 30 issues, through the school year.

Bringing High School Biology Up-to-Date: Paper Chromatography

J. DAVID LOCKARD
Science Teaching Counselor
A.A.A.S. Science Teaching Improvement Program
The Pennsylvania State University, University Park, Pa.

One of the outstanding techniques now being used to move back the frontiers of science is that known as "paper chromatography." It is only one in a raft of new techniques perfected in the last 10 to 20 years that is being used to separate out various organic and inorganic substances for analysis. What is fortunate about some forms of paper chromatography is that certain basic steps in the technique can be used and taught in the high school science classroom. The elementary teacher may even use the technique to show youngsters how to separate ordinary ink into its various components, by using water as the solvent.

In its simplest form the process of paper chromatography follows: (1) a drop of solution containing the substances to be separated is placed some distance from the edge of a strip of filter paper. (2) the edge is then lowered into a solvent so that at the beginning the spot is a short distance above the surface of the solvent. (3) as the solvent moves past the spot by means of capillary action, the different substances in the original spot move along the filter paper with the solvent at differing rates. (4) one by one the substances separate out along the filter paper. (5) either by their inherent color or by a color reaction of a sprayed-on reagent, characteristic spots appear so that detection of each individual substance is possible. Thus the name "paper chromatography"—a color graph on paper.

The theories behind the actual separation of the substances seem to narrow down to one or more of three possible explanations: (1) surface adsorption, (2) ion exchange, and (3) partition between a moving organic solvent and the stationary absorbed water layer on the cellulose. Detailed explanations of these theories can be found in several of the references given in the bibliography at the end of this article and others appear from time to time in the scientific journals. Making a comparison of this technique with that of fractional distillation and continuous liquid-liquid extraction may be of some value in explaining the process to students.

It is the purpose of this article to give a method of paper chromatography which can be employed in most high school biology classrooms. The method is neither time-consuming nor does it take a great deal of skill or experience. The materials and equipment are found in almost all high school laboratories. Do not be misled however, into thinking that the methods normally employed in research are always as simple as this method or that only a little time went into perfecting paper chromatography. New and better methods are developed every day and the technique has yet to be applied to many, many substances. Reading of these developments in the scientific journals is recommended for all science teachers.

Chromatographic Separation of Chloroplast Pigments

Materials and Equipment Needed: Green leaves, ¾″ by 10″ strip of Whatman No. 1 filter paper, ethyl ether, a little sand, mortar and pestle, 8″ test-tube with a tight-fitting stopper, an eye-dropper with a fine capillary opening, petroleum ether, a small glass container, acetone, and benzene.

Removal of Pigments: Tear a green leaf into small pieces and place in a pestle with a little sand and 3-4 ml. of ethyl ether. Macerate the tissue with a mortar until the ether-soluble pigments make a dark-green extract. Pour this extract into a separate container.

Preparation of Paper: Using the eye-dropper, place 3 or 4 drops of the green extract about ½″ from one end of the filter paper strip. Be careful to let each drop dry before adding the next one.

Preparation of Solvents: Make up a solution

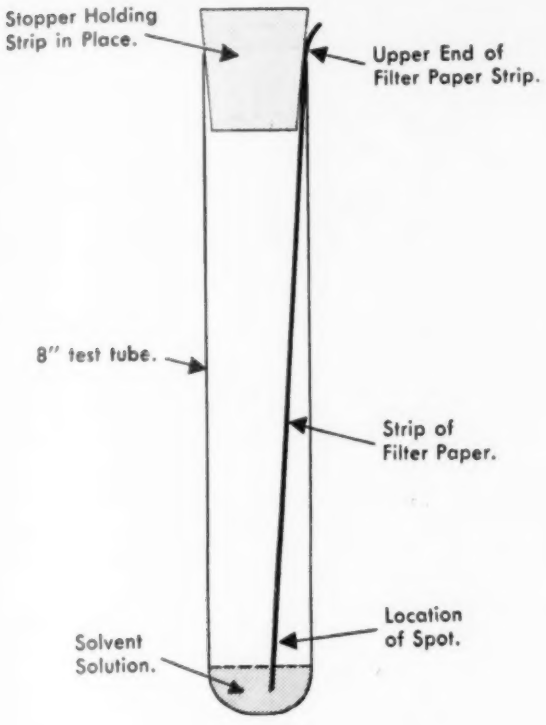

FIGURE 1

mixture of 4.5 ml. of petroleum ether, 0.5 ml. of acetone, and 0.1 ml. of benzene in a glass container. Pour enough of this solution into the 8" test tube so that it fills the bottom ½" of the tube.

Experiment Set-Up: Slowly and carefully lower the filter paper (extract end first) into the 8" test-tube containing the solvent. When about ¼" of the strip is immersed in the liquid, secure the strip with the test-tube stopper. The arrangement is similar to that in the accompanying sketch. Fig. 1

Observation: Observe the chromatogram over a 20-30 minute period. Watch for the characteristic color spots as each pigment separates out along the paper. Reading from the bottom of the strip, the following colors should appear as shown on the accompanying sketch: Fig. 2 (1) yellowish-green, (2) blue-green, (3) orange and (4) yellow.

Comment: The greens contain chlorophylls and the oranges and yellows contain carotenoids. The appearance of the paper chromatogram will be affected by the concentration of the extract as well as the number of drops used to make the spot. By varying these two factors one can bring about good results for

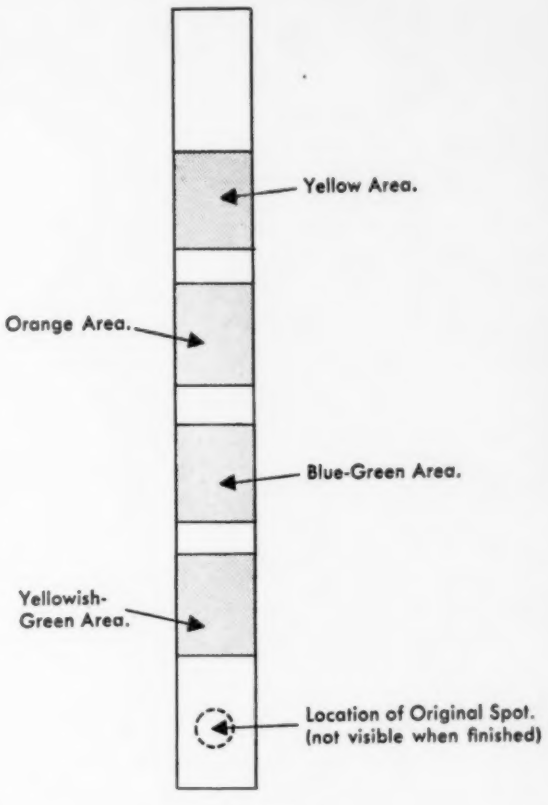

FIGURE 2

most of the common leaves that will be used. After experimenting with the chloroplast pigments, the students may want to go on with other forms of chromatography as well as working with other substances and paper chromatography. Also they may want to try two-dimensional paper chromatography in which, using larger sheets, the chromatogram is first run on one edge and then after that is dry, it is run on another edge. The ascending method explained in detail above may also be supplemented by the descending method, in which the spot is at the top of the strip and the solvent runs down the paper.

The bibliography listed below may help students find their next exploration in "paper chromatography."

Balston, J. N. & Talbot, B. E., *Guide to Filter Paper and Cellulose Powder Chromatography*, H. Reeve Angel & Co., Inc., N. Y.

Block, R. J., Strange, L. E., Zweig, G., *Paper Chromatography, A Laboratory Manual*, Academic Press, N.Y., 1952.

Cramer, F., *Paper Chromatography*, Second

Revision, England Ed., St. Martins: Macmillan, London, England, 1954.

Stein, W. H. and Moore, S., Chromatography, Scientific American Magazine, March 1951, pp. 35-41.

The Teacher Is the Key

The importance of teachers as the keystone in education is often lost sight of in efforts to improve athletics, pass bond issues, and obtain school construction, an industry official declared recently.

"Important as these things are," said A. Lachlan Reed, director of industry-education relations for Minneapolis, Honeywell Regulator Company, "teachers really make or break education. They cost the most and contribute the most."

"Education, like the military," he said, "is overburdened with staff, with planners, with officers, with logistics people, special service people: butchers and bakers and candlestick makers. These make the army go—but the infantry is the queen of the battles, and the battle is the pay-off. In education, likewise, we have necessary and badly needed staff and special service people. But in education the classroom is the pay-off, and the good teacher makes the pay-off good."

Teachers can take steps to help correct this condition, Reed declared, by applying to school manpower problems some of the same production and sales techniques used by the successful business.

This means the teacher must have confidence in her ability to make a good "product" —better-trained youth. She must also have the equipment to accomplish this in the form of better training for herself. Finally, she must tell and sell her importance to the American people.

"This sales job," Reed said, "can be accomplished most effectively by stimulating the interest and support of pupils and parents and by closer cooperation with the more than 10,000 citizens' groups in America that are interested in education."

"There are now seven Chinese and Russians for every American," he added. "We've got to make that one American better than seven Communists in knowledge and skill—and in energetic interest in making the most of himself."

Do You Use a Check List of Activities?

STEVE PATTEE

Jefferson High School, Cedar Rapids, Iowa

Do you have a list of activities, demonstrations, and reports which you like to have the pupils present in each class? Such a sheet on your desk has advantages:

1. Plans can be started early enough so that pupils can be trained to make the presentations instead of finding that the teacher must do it the last minute.

2. The list can be made so that the teacher will see at a glance if a plan has been started and the name of the pupil who is responsible. An OK by the name can show that the pupil's planning is progressing satisfactorily. A line through the name can show that the presentation has been made to the class.

3. The teacher's list of activities grows in quality and quantity from class to class and from year to year.

4. Such a plan gets the teacher away from the question and answer method of "teaching." Pupils "carry the ball" much of the time.

One Teacher's Check List For Chapter One of a Text.[1]

	Hr. 1 John	Hr. 2 Mary	Hr. 3 Paul
How to mount a specimen in water or glycerin for microscopic examination.[2]			
How to use the high power of the microscope.[2]			
How to cut and mount a thin section of material.[2]			
How to observe an animal in a depression or well slide.[2]			
How to stain a tissue.[2]			

[1]Ella Thea Smith, *Exploring Biology*, 4th Ed., Harcourt, Brace and Company, Chicago, 1954.

[2]Ditto sheets provided by teacher.

FIG. 1. Richard Weiss completes his demonstration of staining tissues.

How to stain frog blood with Wright's stain.[2]
Gadgets that solve crime.[3]
History of the microscope.[4]

Pupils volunteer for many of these activities. However, sometimes the teacher just "goes down the row" and assigns those not requested by a pupil.

Present the question or problem to the class. Encourage the pupils to suggest solutions or methods to be tried. Then the teacher can hand the pupil who will make the demonstration, a sheet or book having the tested and approved method. Let him decide how to present it.

Have the materials for each demonstration in a box at the station where the pupil will work or place the box on his desk. Have a slip in the book with page references and suggestions so it can all be handed to the pupil.

The planning and preparation may take class time for one, two, or even three days before the presentation is actually made by the pupil. Then at the next laboratory period many of these techniques are tried by other pupils who observed the pupil demonstration.

Each activity will show four steps: the statement of the problem, planning and preparation, presentation, and evaluation of the method. Only when the pupils fail to prepare and present a necessary technique does the teacher do it.

[2] *Science Digest*, July 1951, p. 17.
[3] Emily Eveleth Snyder, *Biology in the Making*, Chapter 3, McGraw-Hill, 1940.

FIG. 2. Margy Harris shows how to mount bread mold in a well slide.

If you haven't tried this method, don't say, "It can't be done in my room with 30 pupils." It is being done under today's ordinary science room conditions. The biggest aid is a duplicator which will provide copies of directions that can be handed to pupils without fear that they will lose your only copy.

Conservation Committee

One of the busy and important committees of the NABT is the Conservation Committee. It has many activities in progress, as well as a highly successful record in the past. If any NABT member is interested in working on the Conservation Committee he should contact a committee member or write the chairman.

Following are the members of the committee.

Chairman—Richard L. Weaver, P.O. Box 2073, Ann Arbor, Michigan

Project Leader—Urban Conservation—Dr. E. L. Palmer, 2026 Oak Hill Road, Ithaca, New York

Project Leader—Outdoor Laboratories—Dr. John W. Brainerd, 836 Wilbraham Rd.,

The A.A.A.S. Meetings in 1958 will be held in Washington, D. C.

Biology in the News

BROTHER H. CHARLES, F.S.C.
St. Mary's College, Winona, Minnesota

HOW TO BE YOUNG, HEALTHY AND BEAUTIFUL, Elizabeth Honor, Cosmopolitan, November 1957, pp. 81-87.

A provocative discussion of teen-age habits, and how present know-how can aid teenagers improve their health and attractiveness.

EPIDEMIC, Evan Wylie, McCall's, November 1957, pp. 68, 114-120.

How Detroit fought diphtheria after the disease reached epidemic proportions. A good article to touch off a discussion of what your community should do to prevent a similar epidemic.

YELLOW JACK IS BACK, Steven M. Spencer, Saturday Evening Post, October 19, 1957, pp. 38-39, 123-126.

Yellow fever is on the increase in Central America and is moving northward. This account of present efforts to control this all-time killer is both interesting and profitable.

ARTIFICIAL ARTERIES CAN SAVE YOUR LIFE, Steven M. Spencer, Saturday Evening Post, November 2, 1957, pp. 34-35, 74-80.

Nylon tubing is now being used by surgeons to repair major damage to vital blood vessels.

WE'VE GOT THE WEATHER LICKED, Arnold Nicholson, Saturday Evening Post, November 9, 1957, pp. 34-35, 125-128.

Would you prefer year-round air conditioning? You can have it even though your house was not originally constructed for it. This article discusses problems of changing houses to this type of comfort and effective methods of doing so.

FIRST SEE YOUR DEER, Charles Niehuis, Outdoor Life, November 1957, pp. 48-51, 129.

An excellent description of the life of deer and the kind of country in which they thrive. Some good points for deer hunters also.

COON HUNTING, Ray Beck, Outdoor Life, December 1957, pp. 54-55, 87-92.

An interesting story of a coon hunt which includes much factual material about the life and habits of coons.

START YOUR BOY RIGHT, Keith C. Schuyler, Outdoor Life, December 1957, pp. 68-71, 121-132.

Boys like guns. But should they have them? A father describes how he trained his son to handle guns safely.

HAD ENOUGH OF THE OLD RAT RACE? Howard Upton, Saturday Evening Post, December 7, 1957, pp. 31, 117-118.

Where are we rushing and why? What is the cost? This article can be useful in health class.

THE OCEAN MUST YIELD MORE FOOD, Lionel A. Walford and Henry F. Pringle, Saturday Evening Post, November 30, 1957, pp. 43, 52-54.

How scientists in the Federal Government are trying to help the fishing industry secure more and better fish and thus increase our supply of this protein food.

I'M GLAD I'M NOT A GAME WARDEN, Hal Burton, Saturday Evening Post, November 23, 1957, pp. 44-45, 53-59.

An account of the experience of game wardens who prevent poachers from killing game out of season or from taking more than the legal limits. Good conservation reading.

IT'S NOT ALL IN YOUR MIND, H. J. Berglund, M.D. and H. L. Nichols, Jr., Cosmopolitan, December 1957, pp. 14-16.

Many human ills are psychosomatic. Possibly too many have been diagnosed as such. Physical disorders are frequently overlooked and are the real source of the trouble.

MOST OF MY PATIENTS ARE DOGS, James R. Kinney, V.D.M. and Isabella Taves, McCall's, December 1957, pp. 48-49, 64-69.

A veterinarian's experience with dogs, the article includes answers to many questions we would like to know about dogs and their care.

Books for Biologists

EXPERIMENTS WITH A MICROSCOPE, Nelson F. Beeler and Franklyn M. Branley, 154 pp., $2.75, Thomas Y. Crowell Co., New York, New York.

The book explains how to handle a microscope and how and why it operates. Background material and directions for experiments given are simple and easy to follow. Aside from the microscope, the necessary equipment is found in any home. The practical approach is stressed.

VERTEBRATES OF THE UNITED STATES, W. Frank Blair, Albert P. Blair, Pierce Brodkorb, Fred R. Cagle, and George A. Moore, 819 pp., $12.00, McGraw-Hill Book Co., New York, New York, 1957.

All known species of vertebrates occurring in the continental United States and marine birds and mammals of adjacent waters are included in this volume. Illustrated taxonomic keys are provided for the identification of all vertebrates known to species; geographic ranges are given for all species, and descriptions of important characters are given for most. This book contains the only modern check list of freshwater species of fishes of the United States and in addition has the only set of taxonomic keys for the identification of all United States species. Due to the introductory material and the technical treatment of higher categories, it will serve as a textbook for courses in vertebrate classification, ecology, and natural history.

PLANTS OF THE BIBLE, A. W. Anderson, 72 pp., $6.00, Philosophical Library, Inc., New York, New York, 1957.

Both in the general introduction to the book and in the individual sections more than seventy plants are referred to while the considerable botanical variety of the work is further exemplified by the inclusion of edible plants, spices, balm, fruit as well as flowers. Characters and times of the Bible and evocative pictures of customs and habits of those days are interwoven with later stories of the same plants.

GENERAL BIOLOGY, Harrington Wells and Patrick H. Wells, 520 pp., $6.50, McGraw-Hill Book Co., Inc., New York, New York, 1956.

This integrated general biology text treats the social implications of biology as well as presenting the basic subject matter. The basic objectives are to provide thorough foundational grounding in the essentials of life science in terms of a general education program and to stimulate biology majors to further investigations and studies in the field. Integration of allied physical sciences, coupled with a resume of the essentials of botany, zoology and comparative physiology evolve a composite picture of the living world.

(Continued on page 26)

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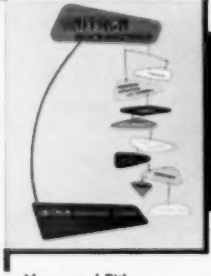

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Books for Biologists

(Continued from page 23)

BOYS' BOOK OF FROGS, TOADS AND SALAMANDERS, Percy A. Morris, 240 pp., $4.00, The Ronald Press Co., New York, New York, 1957.

This book describes and illustrates all the common amphibians of North America. Information about the habits, physical characteristics, life history, how to identify and capture and where to look for frogs, toads, and salamanders is fully explained.

BOTANY, Revised Edition, Carl R. Wilson and Walter E. Loomis, 528 pp., $7.25, The Dryden Press, New York, New York, 1957.

This introductory two-semester textbook is for college freshmen. The first part of the text deals with the structure and activities of the higher plants, the second part with a survey of the plant kingdom. Technical terminology has been avoided wherever it is not essential to an understanding of the subject matter. The general plan of the book has not been changed, but all chapters have undergone revision.

ZOOLOGY, Alfred M. Elliott, 746 pp., $7.00, Appleton-Century-Crofts, Inc., New York, New York, 1957.

This is an introductory zoology book for college use. Organic evolution is the central theme of the work. The eight parts of the book are integrated into an historical narration of animal life.

THE ART OF MELODY, Arthur C. Edwards, 266 pp., $4.75, Philosophical Library, New York, New York, 1956.

The appreciation of a melody is a dynamic and aesthetic experience. This work formulates a system of melodic construction which will unfold the potential of a musical idea according to the basic and enduring principles characteristic of all aesthetic forms.

PRESENT-DAY PSYCHOLOGY, A. A. Roback, 995 pp., $12.00, Philosophical Library, New York, New York, 1955.

A definitive volume of 40 original contributions embracing practically the whole range of psychology from the neurological basis to the military branch and parapsychology, each chapter written by an expert in his field expressly for his work.